

CONSUMER LEVEL DEVICE FOR AUTOMATICALLY TRANSFERRING
DIGITAL IMAGES TO AN INTERNET-BASED SERVICE PROVIDER

TECHNICAL FIELD OF THE INVENTION

This invention relates in general to the field of processing digital images, and more particularly to a system and method for developing images taken by digital cameras, processing those images, and then distributing
5 them on a pre-defined media to pre-defined locations.

BACKGROUND OF THE INVENTION

In the consumer industry, the use of digital cameras is quickly growing as digital cameras are becoming more readily available to consumers. Under the current trend, 5 it is projected that digital cameras may eventually replace conventional film-based cameras. However, the popularity of digital cameras is hampered by the fact that end users must endure a cumbersome process for converting digital pictures into a printed or web-based form. The complexity 10 of the existing process stems from its requirement of end users to follow several steps:

1. Remove a storage media containing image data from the camera (or to connect a transfer cable as appropriate).
2. Download the images to the end user's personal 15 computer (either via an adapter device or through a serial link) using software provided by the camera manufacturer.
3. Optionally manipulate the images on the user's computer to color correct or rotate as appropriate using software that is bundled with the camera or is produced 20 separately.

4. Print the images on the user's printer using software provided by the camera manufacturer, by the printer manufacturer, or by a third-party.

5. Monitor the printer as the pages are printed.

5 6. Crop the printed pages as appropriate.

7. Manage the collection of images on the user's computer for archival and reprint purposes.

8. Delete pictures from the camera storage device in order to make space available for more pictures.

10 A disadvantage of the current process relates to the time end users must spend to convert digital images to a printed or web-based form. Although digital cameras give end users more control over what they shoot and print, the cumbersome process requires a series of time-consuming
15 steps as demonstrated above.

Another disadvantage of the current process relates to managing the storage space for the pictures. Currently, end users must manually manage the storage space available on the storage media. Old image data must be manually
20 deleted or stored in peripheral storage media in order to

make space for new data. The current management of storage space is cumbersome, time-consuming, and costly.

Another disadvantage of the current process relates to the extent of end user interaction. The current process
5 requires that the user be actively involved in each step.

Another disadvantage of the current process relates to the need for a personal computer. The current process requires the use of a personal computer, which costs significantly more than a digital camera.

10 There is, therefore, a need in the art for a consumer image processing device and method having fewer steps, easier steps, and increased functionality.

SUMMARY OF THE INVENTION

In accordance with the present invention, the disadvantages and problems associated with processing digital images have been substantially reduced or
5 eliminated. In particular, the present invention is a consumer-level device that requires a significantly reduced level of user interaction and training in order to perform the steps necessary to process digital images.

In one embodiment of the present invention, the
10 invention involves a device called a reference platform. The reference platform is comprised of a processor and a data storage media that are connected to several interfaces. The device has a camera interface that connects to devices through which digital images from a
15 camera are transferred to the device. Examples of compatible camera interfaces include, but are not limited to, a Compact Flash, Smart Media, universal serial bus (USB), BlueTooth, Sony Memory Stick, floppy disk, compact disk, zip disk, and other compatible interfaces.

Other interfaces of the reference platform device include an RJ11 phone jack and an ethernet port. The device automatically determines if it has access to a high speed network connection and utilizes that capability to
5 access an upload service. In the absence of a high speed network connection, the device has the ability to rely on a dialup connection via an internal modem connected to the user's telephone jack.

An advantage of the present invention is that, after
10 being connected to a service provider, the device does not require additional user interfaces. All functions are controlled via configuration scripts that are downloaded from the service provider. While a variety of scripting languages are useable with the present invention, XML
15 (extensible mark-up language) is particularly adept for this application. The device has the ability to locate a service provider through a series of default setup steps. Once setup is completed, the device is ready for operation.

In operation, the user plugs her camera or memory card
20 into the reference platform device of the present invention

and presses a single button on the device to activate it. The device then connects to the server designated in the configuration script and uploads the images in the camera. The user then has an opportunity to edit the uploaded
5 images using a standard web browser. Any edits are saved and the images are reformatted and rendered onto paper, to a designated website, or burned onto a CD-ROM or other suitable media. The paper images or CD can then be mailed to the user or picked up at the local retail outlet.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and its advantages, reference is now made to the following description, taken in conjunction with the
5 accompanying drawings, in which:

Figure 1 is a flowchart of a method of an embodiment of the present invention to transfer digital images to an internet-based service provider;

Figure 2 is a flowchart of an embodiment of a method
10 of the present invention to configure the device of the present invention;

Figure 3 is a flowchart of an embodiment of a method of the present invention to process media with the device of the present invention;

15 Figure 4 is a block diagram showing internal components of an embodiment of the present invention; and

Figure 5 is a block diagram of another embodiment of the present invention having additional connectors for connecting external devices.

Figure 6 is an embodiment of the method of the present invention;

Figure 7 is an alternate embodiment of the method of the present invention;

5 Figure 8 is a flow chart of a preferred embodiment of the configuration method of the present invention; and

Figure 9 is a flow chart of a preferred embodiment of the operation method of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In accordance with the present invention, the disadvantages and problems associated with processing digital images have been substantially reduced or
5 eliminated. In particular, the present invention is a consumer-level device that requires a significantly reduced level of user interaction and training in order to perform the steps necessary to process digital images.

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10 involves a device called a reference platform. The reference platform is comprised of a processor and a data storage media that are connected to several interfaces. The device has a camera interface that connects to devices through which digital images from a camera are transferred
15 to the device. Examples of compatible camera interfaces include, but is not limited to, a Compact Flash, Smart Media, universal serial bus (USB), BlueTooth, Sony Memory Stick, floppy disk, compact disk, zip disk, and any other compatible interfaces.

Other interfaces of the reference platform device include an RJ11 phone jack and an ethernet port. The device can optionally automatically determine if it has access to a high speed network connection and utilizes that
5 capability to access an upload service. In the absence of a high speed network connection, the device has the ability to rely on a dialup connection via an internal modem connected to the user's telephone jack to establish a connection with the service provider's network.

10 An advantage of the present invention is that, after being connected to a service provider, the device does not require additional user interfaces. All functions are controlled via the configuration script that is downloaded from the service provider. While a variety of scripting
15 languages are useable with the present invention, XML (extensible mark-up language) is particularly adept for this application. The device has the ability to locate a service provider through a series of default setup steps.

Configuration scripts contain information specifying,
20 among other things, network behavior, including, for

example, IP networking characteristics (such as IP address,
net mask, and default gateway; default phone numbers(s) to
dial; dialup and network logon information; passwords and
usernames necessary to log on to the service; time for the
5 device to dial or not to dial; behavior for processing or
images from the media (such as to delete or not delete the
image); and locations to download new software for the
device.

The setup method for the reference platform device
10 works by having a target telephone number (stored in a non-
volatile memory) for establishing a PPP (point-to-point
protocol) connection or an IP configuration, defaulting to
using DHCP (dynamic host configuration protocol), for
connecting to a specified service provider. Once the
15 device is connected to the service provider, it will
download a new configuration file (or another well-defined
file format) specific to the device, which can optionally
override any previous configuration value, including
changing the IP configuration and telephone number to dial.
20 In the event of a complete failure to locate a networking

connection after a change, the device can be programmed to revert back to its default configuration and attempt again to make a connection.

In an embodiment of the present invention, a general purpose input/output with two LEDs and a pushbutton is used. Until the device has successfully connected to the service provider and downloaded configuration data, one of the LEDs is activated to indicate the device's state. The pushbutton is used to activate initialization of the device.

In an alternate embodiment, the device may be configured to exist on a local network that does not support DHCP, which then allow a user to specify a network behavior for the device at the service provider and to encode configuration information to the device when the device is next connected to the service provider. Through the use of these configuration preferences, many configuration possibilities become available. In one embodiment, the device may be targeted initially to any service provider by loading such information before sending

the device to the consumer. Later, the device may be reconfigured at the consumer site for a new service provider (or a change in the service provider access information) by downloading a new configuration file.

- 5 Through the use of configuration preferences, the device may be locked to a single service provider to ensure a steady relationship with the consumer with or without a range of options.

The device may be configured to provide appropriate
10 security. In order to prevent another user from fraudulently submitting pictures or accessing the configuration for another device, the protocol for validating the connection involves certifying the device's serial number with either a public key encryption or
15 another secure connection mechanism. This precaution prevents a user from submitting pictures on another person's account.

In a preferred embodiment, configuring the device involves the user contacting the service provider (via,
20 e.g., the Internet or telephone) to establish an account.

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In establishing an account, the user provides certain information, for example, the serial number of the device; the user's identity; the method of payment for services; default preferences for prints; custom network
5 configuration information for the device; and the times when the device is scheduled to dialup. The service provider associates the user and preferences with the specific device and targets all of the uploads from that device to user. If the user attempts to ask the device to
10 upload pictures before an account has been established, the device will not upload the pictures. Once the account has been established, the device can connect to the service provider and download the configuration file. The configuration file can be stored as a simple XML script or
15 another well-defined file format. Once the configuration file has been downloaded, the device of the present invention is ready for use.

One of the user preferences settings allows the user to choose when the device will call the service provider.
20 The ability to schedule dialup times is desirable when the

consumer prefers to wait, for example, until the middle of the night to tie up the phone line for several hours uploading pictures instead of tying up the phone line during the day.

5 Image files are transferred between the imaging device (e.g., a camera) and the service provider via the reference platform device of the present invention. A file transfer mechanism, such as a secure HTTP (hyper text transfer protocol) GET/PUT operation or a FTP (file transfer
10 protocol) or other mechanism are used for the transfer.

 The device can download all of its device access software from the service provider, allowing it to be configured and upgraded as needed to support any camera that connects to the physical interfaces supported by the
15 device.

 Once the image files are uploaded from the imaging device to the service provider (via the reference platform), the files are processed. Using the imaging device, the user submits a request to the service provider
20 in the form of a print request form. The print request

form can be a script which can specify, for example, print preferences, such as the number of prints, quality of the prints, and size of the prints. As with the configuration script, the print request script can utilize XML, or any
5 other scripting language or format.

The print request form and the images are then transferred from the imaging device to the service provider via the reference platform of the present invention. The service provider can then reformat the files (if necessary)
10 and record the data onto a designated media, such as printed paper, compact disk, floppy disk, or web-based form. Alternatively, the image files can be forwarded to a designated location, such as another user or another company, where the files can be reformatted, manipulated,
15 and recorded onto a designated media. Before recording the images onto a designated media, the image files may be manipulated (to color correct, rotate, crop and otherwise edit as appropriate) by the user via a standard web browser and the Internet. The processed images can be mailed or

transmitted to the user or can be made available for pick up.

The methods discussed above are illustrated in the flowcharts of Figures 8 and 9. Referring to the configuration method of Figure 8, the method starts at step 802. First, the user contacts the service provider in step 804. Contact can be established by telephone, mail, e-mail, Internet web site, or other suitable mediums. In step 806, the user submits information that is requested or required by the service provider to perform the service, such as name, address, billing method, default printing instructions, delivery instructions, custom network information, dialing time periods, etc. If the user's request for an account is accepted, the service provider then creates a user account and generates a configuration script specifically for the user's reference platform (using, for example, the reference platform's unique serial number), step 808. If the user hasn't already done so, the user then plugs the reference platform into a connection receptacle such as a telephone jack (or similar connection

point) and the power cable into a wall plug, step 810. The reference platform then contacts the service provider and downloads its configuration script, step 812. The configuration process is then complete, step 814.

5 Operation of the reference platform of the present invention is illustrated in Figure 9. Referring to Figure 9, the method starts at step 902. First, the user connects their imaging device (such as a camera or camcorder) to the reference platform of the present invention, step 904. The
10 user then generates a print request form (script) with the imaging device, step 906. The print request form can be used to designate the specific files to be processed and/or printed, as well as specify the sizes, styles, payment and delivery method for the requested images. The user then
15 commands the imaging device to upload the print request form and user-designated image files to the service provider via the reference platform of the present invention, step 908. In some cases, for example where the imaging device does not have a user interface such as when
20 a memory card is plugged into the reference platform, the

mere connecting of the memory card (or similar device) into the reference platform will automatically initiate an upload of the image files contained within the image device or memory card along with the reference platform's configuration script to the service provider without any other user action. In this case, a print request form is not used and the pre-defined printing and delivery instructions contained within the reference platform's configuration script are used to indicate how the image files are to be processed/printed/rendered and how they are to be delivered to the user.

Again referring to Figure 9, once the files have been uploaded to the service provider, the service provider can then process and/or print the images according to the print request form or, if no print request form is specified, then by the default instructions specified in the device's configuration file that is also uploaded with the image files, step 910. Once processed, the rendered images are delivered to the user, step 912, and the method ends, step 914.

An advantage of this invention is that it eliminates many of the steps that a user would otherwise perform in order to obtain printed or web-based pictures. Because of the use of a dynamic configuration, the device can be
5 maintained and supported by the service provider, which further eliminates the need for consumer level user input.

In an alternate embodiment, the present invention may be built into a digital camera and thus will not require an external device. The present invention allows connection
10 of digital cameras to the internet without the need for a personal computer.

Another benefit of the present invention relates to offering print services for digital photographs with no need for a personal computer. With digital cameras
15 becoming widely available at lower costs, it is beneficial to have the ability to provide printed pictures without having to incur additional expenses related to a personal computer.

In accordance with another embodiment of the present
20 invention, the device may transform the images to a

different format that may be more desirable for the service provider or may apply any other image correction as desired by the service provider.

Figure 1 is a flowchart of a method of transferring
5 digital images to an internet-based service provider. As illustrated in Figure 1, the process begins at step 102. First, in step 104, the user plugs in the device to establish a server connection. Next, in step 106, the device is configured. This step is further illustrated in
10 Figure 2. Next, in step 108, the media is processed. This step is further illustrated in Figure 3. In step 110, the desired results are obtained and the method ends in step 112. The procedure to obtain results, step 110, provides the user with an ability to choose into which media the
15 resulting images are to be rendered. For example, the user may choose to have the pictures developed into prints at a nearby photo processing center that can be picked up or mailed to the user. Alternatively, the user may choose to have the pictures made available in web-based form at a
20 specific site on the Internet. The user may also choose to

have the processed images sent back to the user's device to be printed on the user's printer.

Figure 2 is a flowchart of a method of setting up the device. As illustrated in Figure 2, the process begins at
5 step 202. Next, in step 204, a decision is made whether boot media is available. If no boot media is available, then step 210 is next, wherein the device is booted from onboard storage, using non-volatile RAM, such as flash memory and EEPROM chips. Next, in step 212, default
10 settings are loaded from the onboard storage to the device's microprocessor.

However, in step 204, if boot media is available, then step 206 is next. In step 206, the device is booted using the boot media. Next, in step 208, default settings are
15 loaded from the boot media to the device.

Next, in step 214, a decision is made whether there is a network connection available. If none is available, then step 218 is next. In step 218, another decision is made whether there is a telephone connection available. If none
20 is available, then no server connection is possible and the

method ends in step 230. If a telephone connection is available, then in step 20, the device makes a dialup connection to the default server.

In step 214, if a network connection is available,
5 then the device connects to the network to connect to a default server. Next, in step 222, configuration data and optionally a serial number are uploaded to the default server. These data allow the default server to identify the particular device thereafter.

10 Next, in step 224, the default server displays options to the user. Options include information, such as a username and password; a method of payment; a setting to allow access; a printing preference; a printing location preference; a mailing preference; and an e-mailing
15 preference. Next, in step 226, the user optionally inputs new configuration settings to the default server. Next in step 228, the revised settings are downloaded in the form of a configuration script and are stored on the onboard storage and the method ends in step 230.

Figure 3 shows a flowchart of a method for processing the media. The method begins at step 302. Next, in step 304, the user attaches the media component to the device. The media component may be a memory card to be inserted or
5 a camera or other imaging device that is attached or otherwise connected to the reference platform device. In step 305, a check is made to determine whether or not the current time is within the designated upload period specified in the configuration script. If not, step 305 is
10 repeated until the appropriate upload time is encountered. Otherwise, in step 306, the device establishes a communication link with a designated server by a designated connection. Next, in step 308, the device uploads data from the media component to the designated server. Next,
15 in step 310, the media is processed at the designated server. Next, in step 312, the server forwards the processed media in a designated format to a designated destination and the process ends in step 314.

Figure 4 is a block diagram showing internal
20 components of an embodiment of the present invention. The

device 400 is encased in housing 402. Internally, DART 422 provides a universal asynchronous receiver-transmitter to handle asynchronous serial communication and is connected to bus 429. RAM 424 provides memory storage and is
5 connected to bus 429. DRAM (dynamic random access memory) and other types of RAM including SRAM (static random access memory) can be used. NvRAM 426 provides non-volatile memory capability provides a mechanism for storing configuration information and is connected to bus 429.
10 Microprocessor 428 is connected to bus 429. The microprocessor 428 is used to manage the various functions of the device with appropriate software that is loaded from the RAM 424, NvRAM 426, the network, or other storage media. Power supply 430 supports two rails 431 providing
15 5v/3.3V to the device. In an alternative embodiment of the present invention illustrated in Figure 4, a power supply supporting one rail at 3.3V to the device can be used in lieu of power supply 430 and power rails 431. Power cord 449 connects power supply 430 to a standard wall socket.
20 General purpose input/output (I/O) 432 is connected to bus

429 and operates to two LEDs 433 and provides signal connection to the device for button 435. Compact flash (CF) socket 442 is connected to bus 429. 10BaseT MAC (media access control) 434 is connected between bus 429 and 5 10BaseT physical layer element 438, which is coupled to a standard RJ45 socket 444, to provide network communication. Although a 10BaseT system is illustrated, it should be noted that other types of ethernet, such as Category 5 100BaseT (or Fast Ethernet that supports data transfer 10 rates of 100 Mbps) and Gigabit Ethernet (which supports data transfer rates of 1 gigabit per second) are also useable with the present invention as well as non-ethernet network systems. Similarly, modem DSP (digital signal processor) 436 is connected between bus 429 and modem data 15 access arrangement (DAA) 440, which is connected to standard RJ11 sockets 446 and 448, to provide telephone communication. In an alternative embodiment of the present invention illustrated in Figure 4, a standard modem with either a modem DAA or an analog line build out (LBO) can be

used in lieu of the modem DSP 436 and modem DAA 440 to provide telephone communication.

Figure 5 is a block diagram of another embodiment of the present invention. The device 500 is similar to device 5 400 of Figure 4 with the addition of connectors for connecting external devices. As illustrated in Figure 5, IDE Connector 550 and Parallel Port Connector 552 are connected to bus 429. IDE Connector 550 serves as an interface for floppy disks. Parallel Port Connector 552 10 serves as an interface for CD-ROMs, zip disks, or other mass storage media. Parallel Port Connector 552 can also be used to connect the device to an external printer. This embodiment is useful when the media is processed at the service provider and desired printing is designated at the 15 user's personal printer. These additional connectors provide a much broader range of functionality to the reference platform device of the present invention.

Operation

1. User Supplied Device

In an embodiment of the method of the present invention is illustrated in Figure 6. In this scenario, the user purchases the reference platform 602 at a retail outlet. The user then takes the device home, and plugs the power cable 449 into a standard wall socket and then plugs either a phone line into one of the RJ11 sockets 446 or 448 or a network connection into the RJ45 socket 444 (see Figure 4). Now the reference platform 602 must be configured.

Upon plugging in, the reference platform 602 goes through a boot-up procedure as outlined above. Assuming that the device was not pre-configured, it will attempt to establish contact with the central server 606 through a network or dial-up connection via a wide area network 604 such as the Internet. Once contact with the central server is established, unique identification information is uploaded from the reference platform 602 to the central server 606. The central server 606 then establishes an account for the reference platform 602 and creates a web page (either statically or dynamically) so that the user

can log into the central server's 606 web server 608 via a standard web browser 610. The user can then direct the central server 606, via the web server 608 to configure the reference platform 602 in one of a wide variety of manners.

5 The central server 606 then downloads the configuration file to the reference platform 602.

One of the many configurations that is possible with the present invention is for the user to designate that the central server process the images (with possible editing
10 via web server 608 and web browser 610) and then print the results with printer 614, impress an image onto a CD with CD writer 612, or place the images on a web site that is served by web server 608 (or an alternate web server). Yet another configuration may direct that the images uploaded
15 to the central server 606 merely be forwarded to another server at a local store 616 that performs any processing and then prints the images with printer 618. Still another configuration has the central server 606 processing the images (with any editing) and then forwarding the processed
20 images electronically to local store 620 where the images

can be printed with printer 622 or written to CD with CD writer 624 and made available for pickup or delivery as designated in the configuration file.

After the device is properly configured, the device is
5 ready for use. First, the consumer transfers images from the camera media to the device by removing the media from the camera or connecting a transfer cable as appropriate. Next, the consumer activates the device by pressing a single button (435 of Figure 4) to connect the device to
10 the designated central server 606 and upload the images that are to be processed. The reference platform 602 can be configured to delete all pictures from the media and camera after each picture is uploaded. At the user's option, the user can connect to the service provider's web
15 server 608 with a standard web browser 610 in order to view, select, edit, and reformat one or more of the uploaded images. Then, the final (selected) images are reproduced onto paper with the printers 614, 622, or 618 (as directed), to a designated web site, or burned onto a
20 CD-ROM or other suitable media with CD writers 612 or 624.

The paper images or CD can then be mailed to the user or picked up at the local retail outlet. The images can be printed at the service provider or be forwarded to another user or company to be further edited and formatted.

- 5 Alternatively, the images can be transmitted back to the user to be printed on the user's printer 603 as illustrated in Figure 6.

2. Business Supplied Device

An alternate embodiment of a method of the present invention is illustrated in Figure 7. In this scenario, the reference platform device 702 of the present invention is made available, either for free or at a low cost, to consumer through a local retail outlet store 722. It is envisioned that such a retail outlet store 722 can be a local drug store, where photo processing commonly occurs although other outlet stores are easily conceivable. In this scenario, the store provides the reference platform pre-configured, with most, if not all of the settings directed to the store's web server and photo process server. Moreover, the pre-configured settings may also

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direct that any photos uploaded from the device are sent to same store that provided the reference platform - thereby enabling the store to recoup its investment by charging the customer for processed images, CD's, etc. For individual
5 user preferences, the store can provide a computing device, such as a personal computer, that can accept pre-approved user preferences and loads the configuration file into the reference platform accordingly. Once so configured, the reference platform needs no further configuration and is
10 ready to use. All the user need do is take the device home, and plug the power cable 449 into a standard wall socket and plug either a phone line into one of the RJ11 sockets 446 or 448 or a network connection into the RJ45 socket 444 (see Figure 4).

15 When the user has taken one or more photos that they wish to have processed, she plugs her camera's memory into one of the connectors provided on the reference platform that is compatible with her imaging device (see Figures 4 and 5). Once attached, she need only push the button 435
20 to activate the device and have the images uploaded to the

central server 708. In an alternate embodiment, the reference platform device is able to detect media insertion (such as a memory card) or camera connection and automatically activate at that time or a later scheduled
5 time without requiring the button to be pressed.

Upon initiation by the user, the reference platform 702 initiates a telephone connection through a telephone link 703. This telephone link is typically a common land line, although it could be a cellular link the allows the
10 user to upload image files without tying up her (single) telephone line for long periods of time. In any case, the connection is routed through the telecommunication service 704 to the dial-up modem 706 of the central server 708. The time of day to call may be specified in the
15 configuration script. Once the dial-up connection is made, the reference platform 702 is ready to upload the one or more image files.

In this scenario, the central server is instructed (by the configuration script that was pre-loaded onto the
20 reference platform 702) to process the uploaded images in a

pre-defined manner. Note, the configuration script is uploaded before the image files are uploaded so that the central server 708 will know a priori the form and the format of the uploaded files.

5 The configuration script that was uploaded from the reference platform 702 may, for example, instruct the central server 708 to print paper copies of the images using the printer 712. Similarly, the central server 708 may be directed to "burn" the image files onto a CD-ROM
10 with CD writer 710. In both cases, the paper copies or CD's can be either mailed back to the user directly.

A slight alteration to this scenario would be for the central server 708 to perform whatever image processing is required of the uploaded image files and then transmit the
15 processed image files to a local store 722 via telecommunications system 704 and modems 706 and 720. The local store 722 can then print the images with its own printer 724 or burn the images onto a CD with its CD writer 726. Once copied to tangible media, the media can either
20 be mailed directly to the user or a call or e-mail message

can be sent telling the user that the results are available for pickup.

The present invention, therefore, is well adapted to carry out the objects and attain both the ends and
5 advantages mentioned, as well as other benefits inherent therein. While the present invention has been depicted, described, and defined by reference to particular preferred embodiments of the invention, such references do not imply a limitation on the invention, and no such limitation is to
10 be inferred. The invention is capable of considerable modification, alteration, alternation, and equivalents in form and/or function, as will occur to those of ordinary skill in the pertinent arts. The depicted and described preferred embodiments of the invention are exemplary only,
15 and are not exhaustive of the scope of the invention. Consequently, the invention is intended to be limited only by the spirit and scope of the appended claims, giving full cognizance to equivalents in all respects.